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Nekite River Spawning Channel 1989 Operations

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Canadian Data Report of Fisheries and Aquatic Sciences

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ABSTRACT

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The Nekite River spawning channel (Central Coast District, British Columbia) has been operated annually for the enhancement of chum salmon since 1986. This report summarizes the data collected during the 1989 Nekite River spawning channel operation. Chum salmon enumeration, camp operation and maintenance of the spawning channel are described.

Winther, I., S.K. Bachen & R.D. Goruk. 1990. Nekite River spawning channel 1989 operations. Can. Data Rep. Fish Aquat. Sci. 793. iii + 27 p.

Le canal de frai de la rivière Nekite (district côtier central de la Colombie-Britannique) est exploité annuellement depuis 1986 pour la mise en valeur du saumon kéta. Le rapport renferme un résumé des données recueillies durant la période d'exploitation de 1989. On y décrit le calcul du nombre de saumons, ainsi que le fonctionnement du camp et la maintenance du canal de frai.

INTRODUCTION

The Nekite River flows into the head of Smith Inlet at 51 25'N by 127 10'W in the Central Coast District of British Columbia within the Department of Fisheries and Oceans, Canada, Statistical Area 10 (Figure 1). The Nekite River spawning channel was completed in 1986 in response to poor production levels for chum salmon. The spawning channel is located 10 km upstream from the river mouth and can support 13,000 spawning chum salmon. Figure 2 shows details of the spawning channel (Winther, Bachen & Goruk, 1989).

METHODS

Equipment and supplies were transported from Machmell Camp, Docee River Camp and Dawsons Landing to the log dump at the mouth of the Nekite River. Supplies were then transported by all terrain vehicle to the camp at the spawning channel.

The cabin and equipment left in the camp were in good condition when the camp was visited in July. Some maintenance to the water line was necessary as holes had developed either from wear or from bears biting the line. A side band radio antenna was installed across the channel.

OPERATION OF THE SPAWNING CHANNEL

The gravel in the Nekite River spawning channel was cleaned of silt and debris in early August in preparation for the spawning season. A bucket loader and a gravel cleaning machine were barged to the log dump and transported to the channel site for this purpose.

The water control valves at the head of the spawning channel were left partially open to allow a flow of water into the channel. The valves were opened to maximum flow September 2. The valves did not appear to be restricting flow prior to being opened to maximum.

A chain link fence wired to reinforcement bar and attached to angle iron driven into the river bed in the form of a "V" was maintained at the bottom of the channel. The fence had a 25 cm (10 inch) opening at the apex of the "V" to discouraged fish from backing out of the channel. The fence also prevented dead fish from drifting downstream. No other fences were required.

Chum salmon were counted in the Nekite channel in the morning and afternoon from August 24 to September 26, 1989. Weather and water levels were also recorded twice daily. Water levels were recorded from two staff gages located in the channel just below the culverts and in the river downstream of the culverts diverting water to the channel.

Dead chum salmon were removed from the spawning channel and sampled for hypural length, nose-fork length, sex, egg retention and scales. A subsample of scales was sent to the Scale Laboratory in Vancouver for ageing. A sample of 100 live fish was taken

September 27 for Genetic Stock Identification (GSI). The GSI sample consisted of hypural length, nose-fork length, sex, scales, otoliths, eyes, heart, liver, and muscle tissue.

RESULTS AND DISCUSSION

Chum salmon were observed in the spawning channel for the duration of the program. The spawning population of chum salmon in the channel increased steadily to a maximum of 5032. Pink salmon were not observed in the channel until August 26. The spawning population of pink salmon reached a maximum of 3000 fish at the end of the study. No decline was seen for either chum or pink populations in the channel but populations appeared to reach a crest before the study was terminated. Fish counts are presented in Table 1 and Figure 3.

It was not necessary to move or divert fish from the river to the channel. The movement of chum into the channel could be the result of cleaning the channel or the return of 3 year olds from the 1986 brood which originated in the channel.

Weather conditions and water levels in the river and in the channel are presented in Table 2 and Figure 4. High water on September 4 brought more fish into the channel as did a return to normal levels on September 19 after low levels for the preceding three days.

The first chum salmon carcass collected from the spawning channel on September 4 was killed by a bear. Spawning mortalities were not collected until September 8. A total of 884 chum salmon, 471 males and 413 females, were dead pitched from the channel (Table 3). The sex ratio was 1.14 : 1 (males : females). Samples were collected from 597 of these fish. Mean egg retention for the 244 females sampled was 69 eggs. If the three prespawning mortalities are excluded from the sample (estimated at 3000 eggs each) the mean egg retention for the remaining 241 females is 32 eggs.

The relationships between nose-fork and hypural lengths for female and male chum salmon are presented in Figures 5 and 6. The formula for the regression lines are:

for females $NF = 36.0 + 1.17 * Hyp$ $(R^2 = 0.92)$

for males $NF = 34.3 + 1.22 * Hyp$ $(R^2 = 0.91)$

where NF is the nose-fork length and Hyp is the hypural length.

Ageing information was not available at the time of publication. Data collected during the dead pitch appear in Appendix 1. Data collected during the GSI sampling appear in Appendix 2.

The Nekite River flooded severely in November. The bridge across the creek above camp was washed out and there were several slides on the road. The river overflowed the channel intake

washing silt and gravel into the top portion of the channel. The settling basin and 250 meters of channel below the basin were heavily silted. The banks sloughed into the channel in several locations. An attempt to estimate the effects of the flood on the channel was made by testing with a shovel and net to determine the egg to fry survival on January 12 and February 15, 1990 (Table 4). Test sites and some effects of the flood are depicted in Figure 7.

REFERENCES

Winther, I., S.K. Bachen and R.D. Goruk. 1989. Nekite River spawning channel 1988 operations. Can. Data Rep. Fish. Aquat. Sci. 753. iii + 13 p. + Appendix.

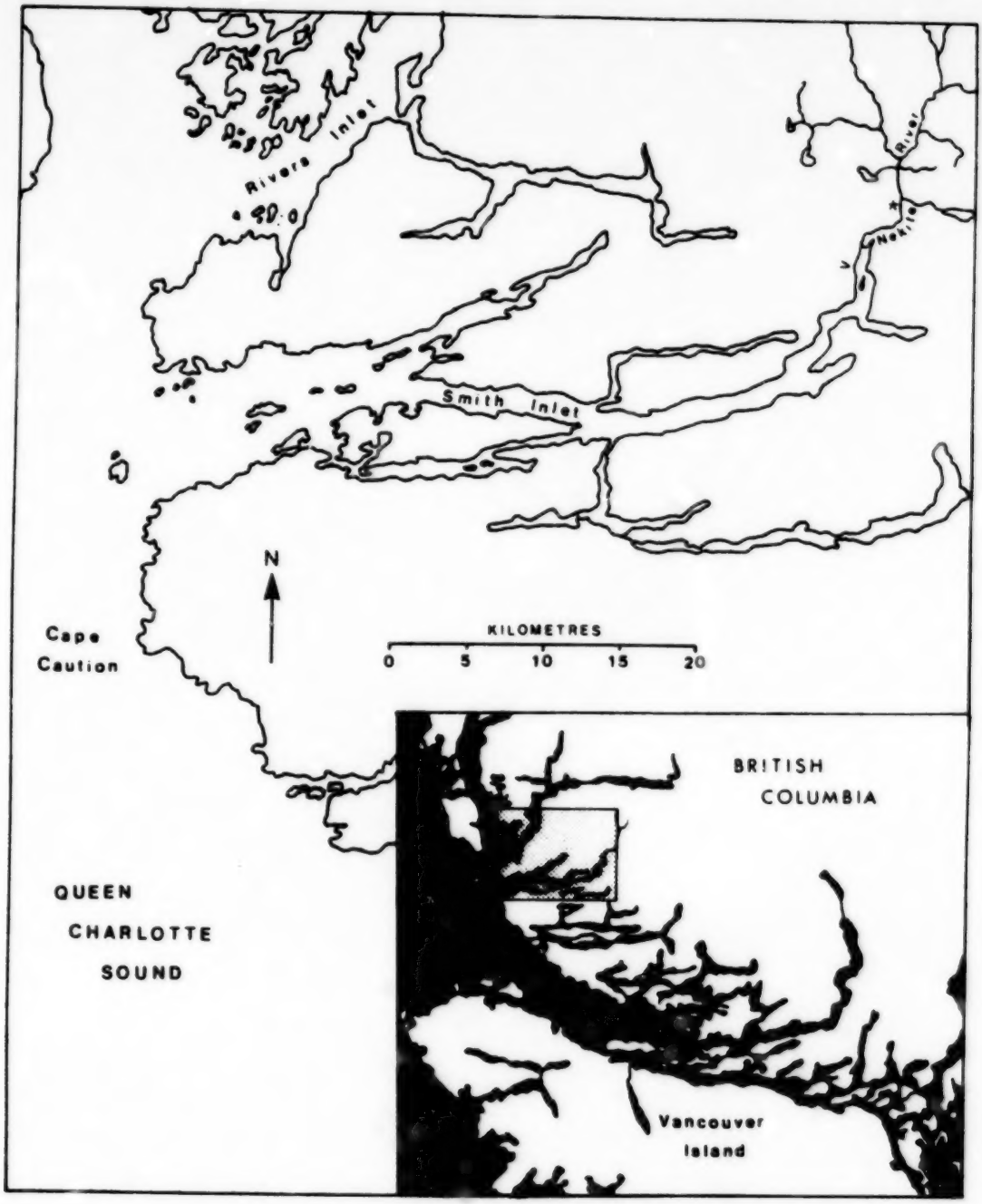

Figure 1: Location of the Nekite River, British Columbia, Canada. The > indicates the log dump and the * indicates the spawning channel site.

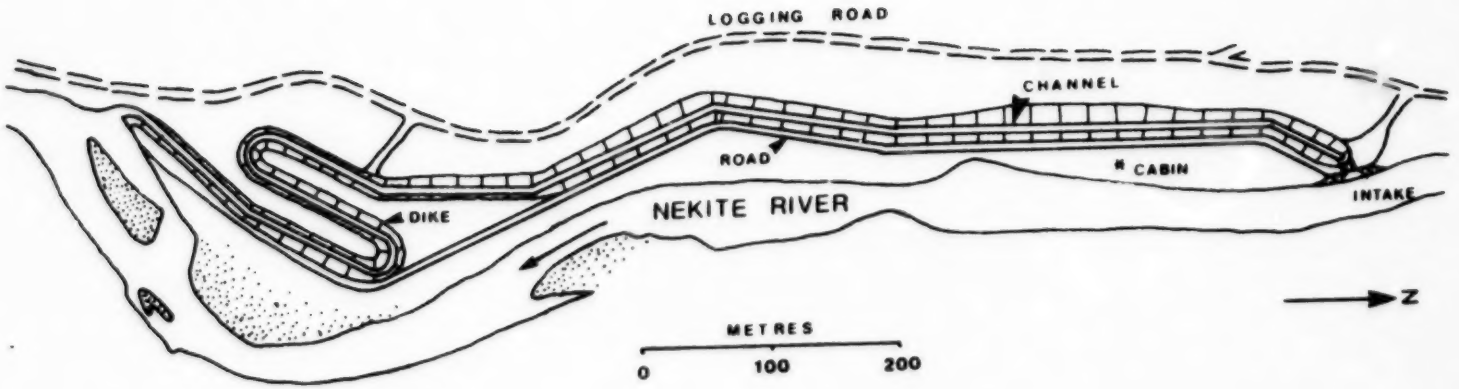

Figure 2: Detail of the Nekite River spawning channel.

Table 1: Salmon counts in the Nekite River spawning channel, 1989.

Date 1989	Chum		Pink	
	am	pm	am	pm
24-Aug	26	30		
25-Aug	36	40		
26-Aug	61	35	12	23
27-Aug	50	55	20	25
28-Aug	57	70	25	27
29-Aug	62	84	12	31
30-Aug	97	153	27	30
31-Aug	135	186	27	28
01-Sep	190	238	27	46
02-Sep	206	327	31	38
03-Sep	304	350	30	31
04-Sep	480	948	30	147
05-Sep	681	1161	100	207
06-Sep	1166	1208	200	278
07-Sep	1173	1232	209	317
08-Sep	1182	1319	250	437
09-Sep	1408	1556	400	500
10-Sep	1647	1778	475	600
11-Sep	1700	1829	600	800
12-Sep	1869	2034	800	1035
13-Sep	1929	2121	986	1000
14-Sep	2091	1993	1000	1000
15-Sep	2800	2833	1200	1300
16-Sep	2650	2842	1300	1300
17-Sep	2700	2714	1300	1300
18-Sep	2763	2650	1300	1300
19-Sep	3500	4136	2000	3000
20-Sep	4248	4145	3000	3000
21-Sep	4000	4062	3000	3000
22-Sep	4606	4521	3000	3000
23-Sep	4982	5013	3000	3000
24-Sep	4800	4981	2700	3000
25-Sep	4918	4891	3000	3000
26-Sep	4739	5032	3000	3000

Table 2: Weather and water conditions for the Nekite river spawning channel, August 24 to September 26, 1989.

Date	Weather		Water levels (ft) Channel		River	
	am	pm	am	pm	am	pm
24-Aug	fair	fair	2.0	2.0	4.0	4.0
25-Aug	fair, sunny	fair	2.0	2.0	4.0	4.0
26-Aug	clear, sunny	windy	2.0	2.0	4.0	4.0
27-Aug	sunny	clear	2.0	2.0	4.0	4.0
28-Aug	cloudy	fair, clear	2.0	2.0	4.0	4.0
29-Aug	cloudy	fair, clear	2.0	2.0	4.0	4.0
30-Aug	misty	clear, sunny	2.0	2.0	4.0	4.0
31-Aug	clear, sunny	clear, sunny	2.0	2.0	4.0	4.0
01-Sep	sunny	clear	2.0	2.0	4.0	4.0
02-Sep	clear, sunny	clear, sunny	2.0	2.0	4.0	4.0
03-Sep	cloudy	rain	2.0	2.0	4.0	4.0
04-Sep	broken cloud	broken cloud	4.0	3.2	8.0	7.0
05-Sep	clear, sunny	sunny, hot	2.0	2.0	5.3	5.0
06-Sep	clear, sunny	clear, sunny	2.0	2.0	5.0	4.3
07-Sep	fog	clear, sunny	2.0	2.0	4.4	
08-Sep	sunny, hot	sunny, hot	2.0	2.0	4.4	4.4
09-Sep	clear, sunny	clear, sunny	2.0	2.0	4.0	4.0
10-Sep	clear, sunny	clear, sunny	2.0	2.0	4.0	4.0
11-Sep	sunny, hot	sunny, hot	2.0	2.0	4.0	3.4
12-Sep	fog	clear, sunny	2.0	2.0	3.4	3.4
13-Sep	fog	clear, sunny	2.0	2.0	4.0	4.0
14-Sep	fog	clear, sunny	2.0	2.0	4.0	4.0
15-Sep	cloudy	cloudy	2.0	2.0	4.0	4.0
16-Sep	cloudy	cloudy, rain	1.3	1.3	3.3	3.3
17-Sep	clear, sunny	clear, sunny	1.0	1.0	3.2	3.2
18-Sep	high overcast		0.4	0.4	3.0	3.0
19-Sep	light rain	cloudy	2.0	2.0	4.0	4.0
20-Sep	clear, sunny	clear, sunny	2.0	2.0	4.0	4.0
21-Sep	clear, sunny	clear, sunny	2.0	2.0	3.4	3.4
22-Sep	clear, sunny	clear, sunny	2.0	2.0	3.4	3.4
23-Sep	fog	clear, sunny	2.0	2.0	3.4	3.4
24-Sep	clear, sunny	clear, sunny	2.0	2.0	3.4	3.4
25-Sep	clear, sunny	clear, sunny	2.0	2.0	3.4	3.4
26-Sep	smoke haze	smoke haze	2.0	2.0	3.4	3.4

FIGURE 3: NEKITE RIVER SPAWNING CHANNEL

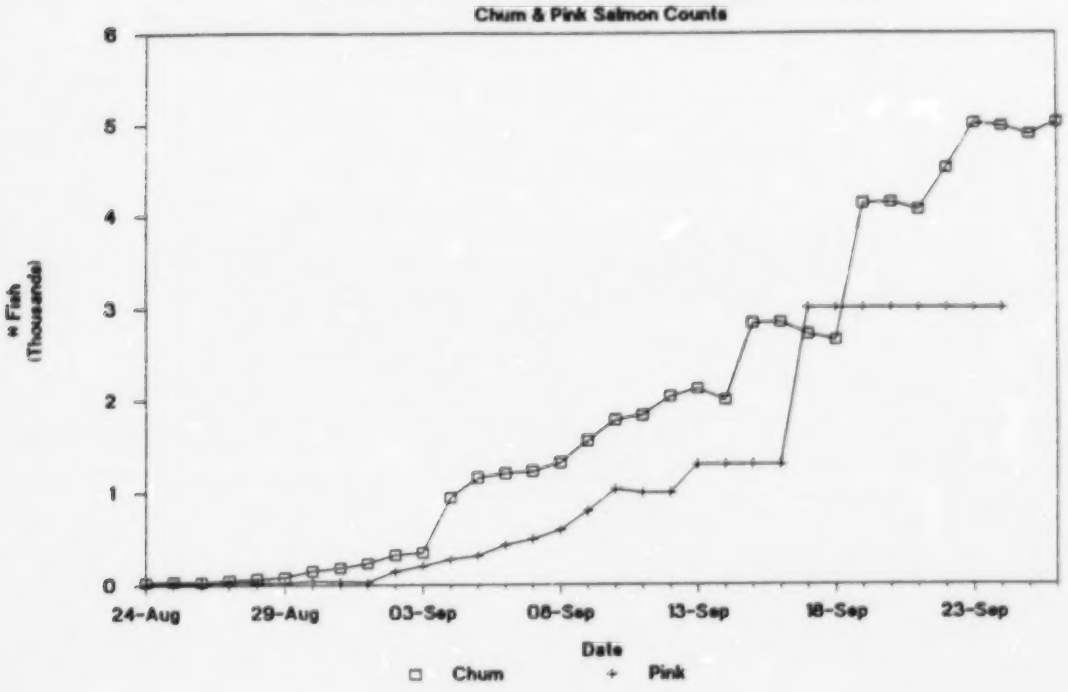

Figure 4: Water Levels for Nekite River

and Spawning Channel 1989.

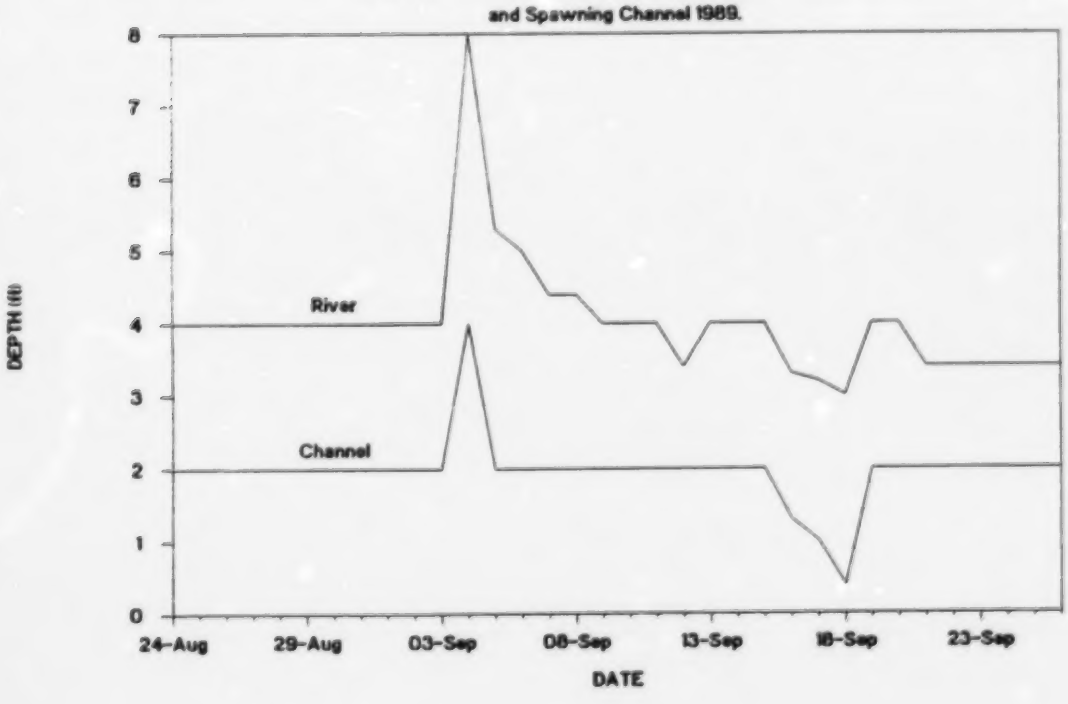

Table 3: Chum salmon dead pitch, Nekite River spawning channel.

Date 1989	Number Dead Males	Females	Cumulative total Males	Females
04-Sep	1		1	0
05-Sep			1	0
06-Sep			1	0
07-Sep			1	0
08-Sep	9	6	10	6
09-Sep	10	6	20	12
10-Sep	20	4	40	16
11-Sep	13	4	53	20
12-Sep	18	7	71	27
13-Sep			71	27
14-Sep	55	19	126	46
15-Sep			126	46
16-Sep	68	32	194	78
17-Sep			194	78
18-Sep	58	42	252	120
19-Sep			252	120
20-Sep			252	120
21-Sep			252	120
22-Sep			252	120
23-Sep	45	55	297	175
24-Sep	58	67	355	242
25-Sep	42	58	397	300
26-Sep	74	113	471	413

FIGURE 5: 1989 NEKITE RIVER FEMALE

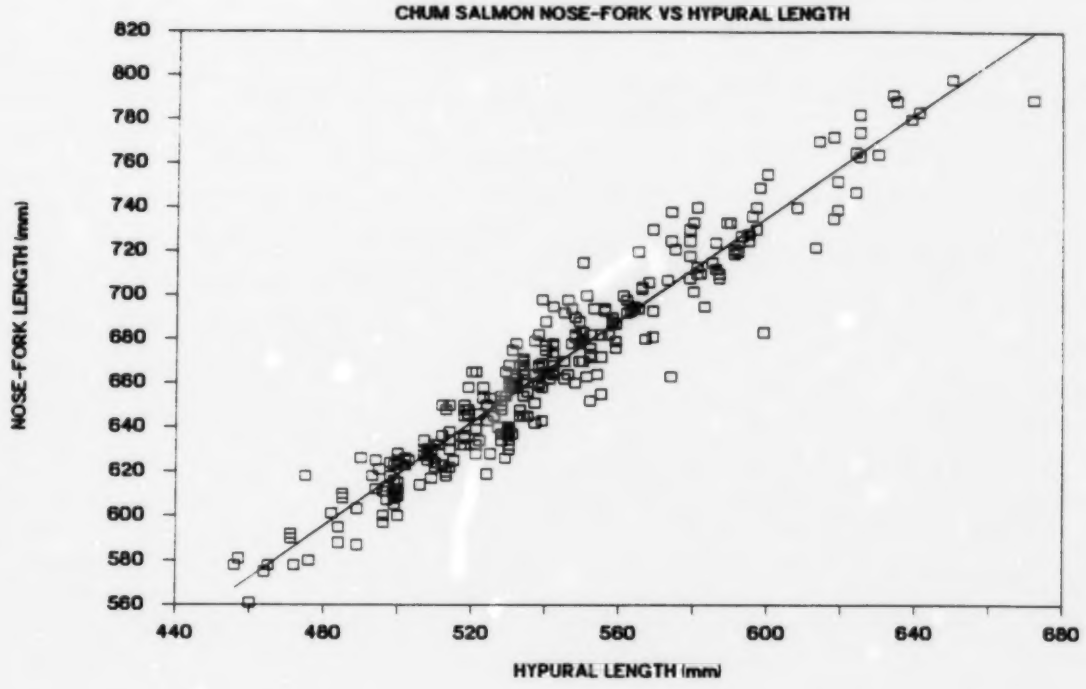

FIGURE 6: 1989 NEKITE RIVER MALE CHUM

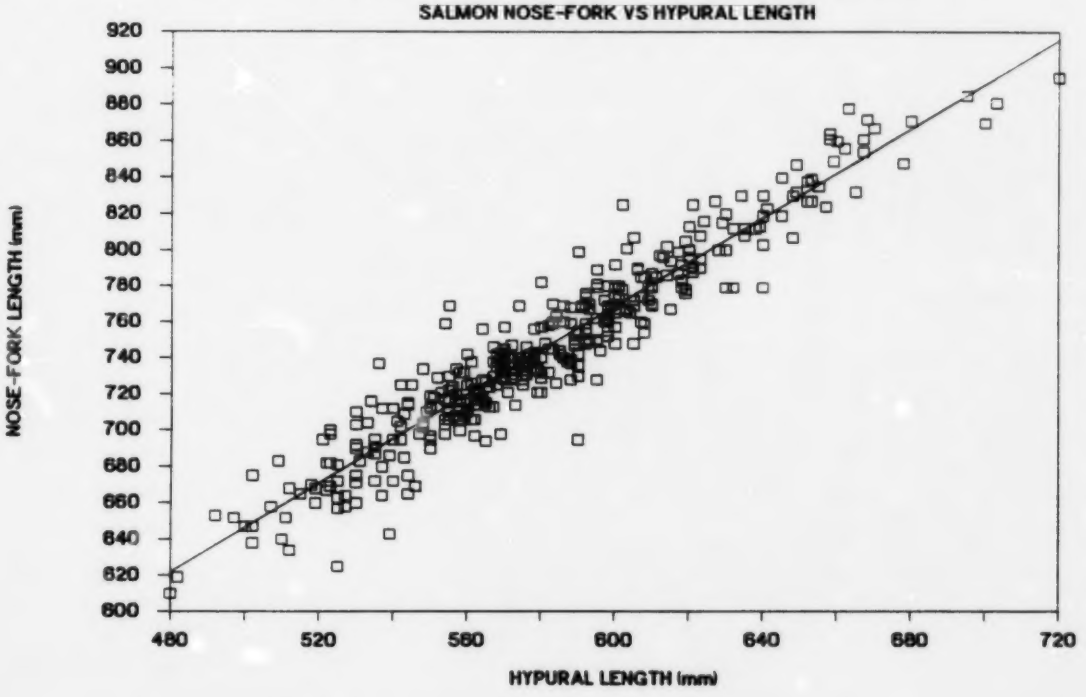

Table 4: Nekite spawning channel test digging for survivals. See Figure 7 for location of sites.

January 15, 1990

Site #	Free swimming	Alevin	Yok sac	Live eggs	Dead eggs	Survival %	Comments
1		4		13	25	40	lots of bugs
2		33	42		25	75	
3		5	16	40	6	90	
4		53	56		20	85	
5							not tested
6							not tested
7				1	17	1	heavy organic
8	78		23			?	
9							not tested
10	3		39	1	5	90	
11	1	5				?	

February 19, 1990

Site #	Free swimming	Alevin	Yok sac	Live eggs	Dead eggs	Survival %	Comments
1		26			39	40	
2	6	19				100	
3		20			20	50	
4	40	28			1	99	
5	20	9				100	
6		2			32	1	
7		37			3		
8							not tested
9					2	0	
10		11			4	73	
11					2	0	
12							not tested

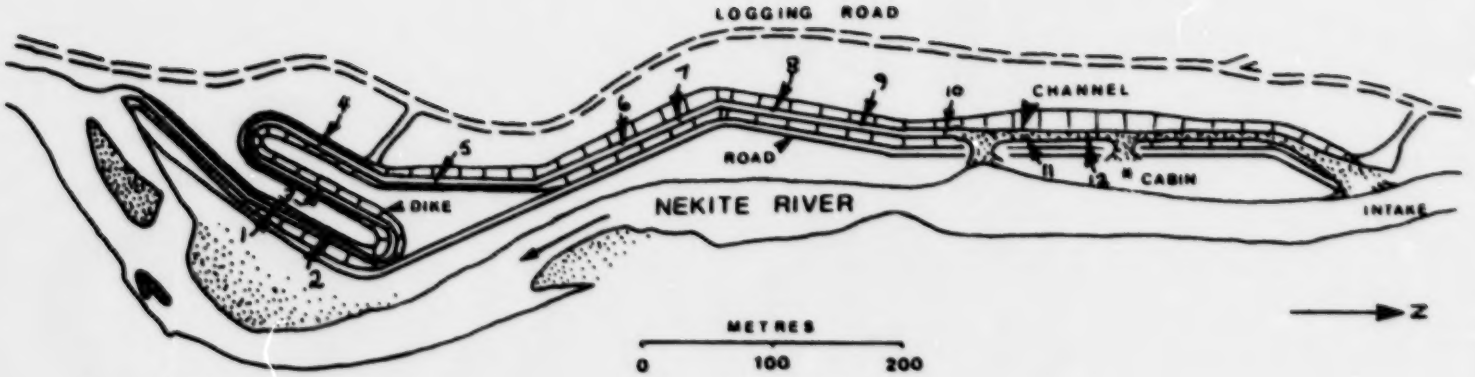

Figure 7: Nekite River spawning channel. Stippled areas were silted in during the November 1989 flood. Numbers indicate test sites for egg to fry survival.

Appendix 1: Chum salmon data from Nekite River dead pitch.

Date	Book #	Scale #	Hypural Length	Nose-Fork Length	Sex	Egg Ret
04-Sep	47133	1	603	801	M	
08-Sep	47133	2	550	715	F	1
08-Sep	47133	3	548	660	F	0
08-Sep	47133	4	610	680	F	0
08-Sep	47133	5	600	705	F	300
08-Sep	47133	6	595	750	M	
08-Sep	47133	7	590	695	M	
08-Sep	47133	8	582	665	F	0
08-Sep	47133	9	581	710	F	0
08-Sep	47133	10	618	783	M	
08-Sep	47133	11	548	734	M	
08-Sep	47133	12	560	710	M	
08-Sep	47133	13	720	895	M	
08-Sep	47133	14	653	839	M	
08-Sep	47133	15	590	742	M	
08-Sep	47133	16	608	754	M	
09-Sep	47134	1	700	870	M	
09-Sep	47134	2	618	735	F	230
09-Sep	47134	3	471	592	F	0
09-Sep	47134	4	601	773	M	
09-Sep	47134	5	586	712	F	0
09-Sep	47134	6	625	774	F	5
09-Sep	47134	7	597	730	F	1
09-Sep	47134	8	615	794	M	
09-Sep	47134	9	628	800	M	
09-Sep	47134	10	614	786	M	
09-Sep	47134	11	629	815	M	
09-Sep	47134	12	607	774	M	
09-Sep	47134	13	591	769	M	
09-Sep	47134	14	610	779	M	
09-Sep	47134	15	581	713	F	0
09-Sep	47134	16	600	792	M	
10-Sep	47135	1	639	780	F	0
10-Sep	47135	2	582	758	M	
10-Sep	47135	3	613	722	F	0
10-Sep	47135	4	600	775	M	
10-Sep	47135	5	509	683	M	
10-Sep	47135	6	655	835	M	
10-Sep	47135	7	662	856	M	
10-Sep	47135	8	617	799	M	
10-Sep	47135	9	614	770	F	
10-Sep	47135	10	703	881	M	1
10-Sep	47135	11	596	744	M	
10-Sep	47135	12	615	767	M	
10-Sep	47135	13	630	800	M	
10-Sep	47135	14	619	778	M	
10-Sep	47135	15	540	672	M	
10-Sep	47135	16	605	807	M	

Appendix 1 continued.

Date	Book #	Scale #	Hypural Length	Nose-Fork Length	Sex	Egg Ret
10-Sep	47135	17	542	664	F	0
10-Sep	47135	18	570	733	M	
10-Sep	47135	19	570	745	M	
10-Sep	47135	20	613	796	M	
10-Sep	47135	21	555	730	M	
10-Sep	47135	22	588	759	M	
10-Sep	47135	23	549	710	M	
10-Sep	47135	24	668	872	M	
11-Sep	47136	1	608	740	F	0
11-Sep	47136	2	623	808	M	
11-Sep	47136	3	610	787	M	
11-Sep	47136	4	527	664	M	
11-Sep	47136	5	580	650	M	
11-Sep	47136	6	560	725	M	
11-Sep	47136	7	603	767	M	
11-Sep	47136	8	590	736	M	
11-Sep	47136	9	640	803	M	
11-Sep	47136	10	607	760	M	
11-Sep	47136	11	552	713	M	
11-Sep	47136	12	554	698	M	
11-Sep	47136	13	587	708	F	0
11-Sep	47136	14	598	762	M	
11-Sep	47136	15	538	667	F	2
11-Sep	47136	16	579	708	F	3
11-Sep	47136	17	767	748	M	
12-Sep	47137	1	590	730	M	
12-Sep	47137	2	619	776	M	
12-Sep	47137	3	618	779	M	
12-Sep	47137	4	555	722	M	
12-Sep	47137	5	574	663	F	3
12-Sep	47137	6	558	708	M	
12-Sep	47137	7	624	765	F	4
12-Sep	47137	8	595	728	F	0
12-Sep	47137	9	604	765	M	
12-Sep	47137	10	652	827	M	
12-Sep	47137	11	657	824	M	
12-Sep	47137	12	625	782	F	0
12-Sep	47137	13	577	742	M	
12-Sep	47137	14	606	789	M	
12-Sep	47137	15	672	789	F	0
12-Sep	47137	16	591	721	F	0
12-Sep	47137	17	608	785	M	
12-Sep	47137	18	667	854	M	
12-Sep	47137	19	592	748	M	
12-Sep	47137	20	544	675	M	
12-Sep	47137	21	600	748	M	
12-Sep	47137	22	525	681	M	
12-Sep	47137	23	564	695	F	0
12-Sep	47137	24	665	832	M	
12-Sep	47137	25	598	755	M	

Appendix 1 continued.

Date	Book #	Scale #	Hypural Length	Nose-Fork Length	Sex	Egg Ret
14-Sep	47138	1	595	762	M	
14-Sep	47138	2	586	724	F	0
14-Sep	47138	3	625	763	F	0
14-Sep	47138	4	494	612	F	4000
14-Sep	47138	5	595	789	M	
14-Sep	47138	6	517	632	F	18
14-Sep	47138	7	533	688	M	
14-Sep	47138	8	559	687	F	0
14-Sep	47138	9	579	721	M	
14-Sep	47138	10	602	778	M	
14-Sep	47138	11	605	772	M	
14-Sep	47138	12	635	808	M	
14-Sep	47138	13	612	797	M	
14-Sep	47138	14	586	760	M	
14-Sep	47138	15	582	710	F	0
14-Sep	47138	16	587	738	M	
14-Sep	47138	17	597	772	M	
14-Sep	47138	18	578	733	M	
14-Sep	47138	19	522	667	M	
14-Sep	47138	20	658	864	M	
14-Sep	47138	21	563	837	M	
14-Sep	47138	22	580	740	M	
14-Sep	47138	23	620	796	M	
14-Sep	47138	24	579	730	F	0
14-Sep	47138	25	518	592	M	
14-Sep	47139	1	598	749	F	8
14-Sep	47139	2	595	728	M	
14-Sep	47139	3	593	767	M	
14-Sep	47139	4	548	702	M	
14-Sep	47139	5	583	745	M	
14-Sep	47139	6	621	788	M	
14-Sep	47139	7	676	745	M	
14-Sep	47139	8	576	735	M	
14-Sep	47139	9	601	780	M	
14-Sep	47139	10	569	736	M	
14-Sep	47139	11	635	788	F	4
14-Sep	47139	12	558	706	M	
14-Sep	47139	13	540	712	M	
14-Sep	47139	14	588	737	M	
14-Sep	47139	15	678	848	M	
14-Sep	47139	16	531	683	M	
14-Sep	47139	17	667	861	M	
14-Sep	47139	18	548	784	M	
14-Sep	47139	19	600	775	M	
14-Sep	47139	20	652	838	M	
14-Sep	47139	21	534	666	F	378
14-Sep	47139	22	582	788	F	53
14-Sep	47139	23	641	823	M	
14-Sep	47139	24	561	738	M	
14-Sep	47139	25	591	768	M	

Appendix 1 continued.

Date	Book #	Scale #	Hypural Length	Nose-Fork Length	Sex	Egg Ret
14-Sep	47140	1	621	825	M	
14-Sep	47140	2	525	653	F	0
14-Sep	47140	3	589	733	F	5
14-Sep	47140	4	653	827	M	
14-Sep	47140	5	575	789	F	0
14-Sep	47140	6	542	678	F	215
14-Sep	47140	7	537	664	M	
14-Sep	47140	8	575	728	M	
14-Sep	47140	9	582	732	M	
14-Sep	47140	10	610	770	M	
14-Sep	47140	11	580	729	M	
14-Sep	47140	12	645	840	M	
14-Sep	47140	13	599	769	M	
14-Sep	47140	14	538	599	F	1
14-Sep	47140	15	500	625	F	0
14-Sep	47140	16	574	740	M	
14-Sep	47140	17	680	871	M	
14-Sep	47140	18	694	755	M	
14-Sep	47140	19	634	830	M	
14-Sep	47140	20	537	712	M	
14-Sep	47140	21	536	737	M	
14-Sep	47140	22	580	757	M	
14-Sep	47140	23	523	653	F	0
14-Sep	47140	24	579	725	F	0
16-Sep	47141	1	524	650	F	2
16-Sep	47141	2	564	756	M	
16-Sep	47141	3	528	634	F	1
16-Sep	47141	4	638	812	M	
16-Sep	47141	5	602	825	M	
16-Sep	47141	6	576	746	M	
16-Sep	47141	7	598	780	M	
16-Sep	47141	8	574	738	F	0
16-Sep	47141	9	612	880	M	
16-Sep	47141	10	592	768	M	
16-Sep	47141	11	500	624	F	1
16-Sep	47141	12	569	730	F	4
16-Sep	47141	13	596	736	F	0
16-Sep	47141	14	634	791	F	105
16-Sep	47141	15	600	767	M	
16-Sep	47141	16	553	694	F	1
16-Sep	47141	17	575	735	M	
16-Sep	47141	18	583	760	M	
16-Sep	47141	19	568	706	F	0
16-Sep	47141	20	559	676	F	167
16-Sep	47141	21	524	643	F	5000
16-Sep	47141	22	532	662	F	0
16-Sep	47141	23	563	721	M	
16-Sep	47141	24	592	759	M	
16-Sep	47141	25	542	668	F	0
16-Sep	47142	1	546	664	F	3

Appendix 1 continued.

Date	Book #	Scale #	Hypural Length	Nose-Fork Length	Sex	Egg Ret
16-Sep	47142	2	619	752	F	6
16-Sep	47142	3	632	812	M	
16-Sep	47142	4	585	742	M	
16-Sep	47142	5	565	694	M	
16-Sep	47142	6	668	735	M	
16-Sep	47142	7	584	763	M	
16-Sep	47142	8	605	769	M	
16-Sep	47142	9	559	732	M	
16-Sep	47142	10	576	737	M	
16-Sep	47142	11	593	770	M	
16-Sep	47142	12	553	721	M	
16-Sep	47142	13	670	779	M	
16-Sep	47142	14	537	664	F	8
16-Sep	47142	15	578	756	M	
16-Sep	47142	16	574	769	M	
16-Sep	47142	17	570	732	M	
16-Sep	47142	18	640	830	M	
16-Sep	47142	19	499	616	F	0
16-Sep	47142	20	540	677	F	9
16-Sep	47142	21	627	827	M	
16-Sep	47142	22	566	713	M	
16-Sep	47142	23	583	770	M	
16-Sep	47142	24	569	729	M	
16-Sep	47142	25	660	860	M	
16-Sep	47143	1	564	718	M	
16-Sep	47143	2	598	767	M	
16-Sep	47143	3	632	779	M	
16-Sep	47143	4	542	695	M	
16-Sep	47143	5	630	779	M	
16-Sep	47143	6	538	682	F	416
16-Sep	47143	7	530	668	F	3
16-Sep	47143	8	662	743	M	
16-Sep	47143	9	552	729	M	
16-Sep	47143	10	485	610	F	101
16-Sep	47143	11	558	690	F	11
16-Sep	47143	12	547	694	F	0
16-Sep	47143	13	548	704	M	
16-Sep	47143	14	559	732	M	
16-Sep	47143	15	587	710	F	0
16-Sep	47143	16	630	764	F	13
16-Sep	47143	17	589	747	M	
16-Sep	47143	18	619	805	M	
16-Sep	47143	19	539	698	F	1
16-Sep	47143	20	571	721	M	
16-Sep	47143	21	535	672	M	
16-Sep	47143	22	649	847	M	
16-Sep	47143	23	639	813	M	
16-Sep	47143	24	640	819	M	
16-Sep	47143	25	620	800	M	
16-Sep	47144	1	598	768	M	

Appendix 1 continued.

Date	Book #	Scale #	Hypural Length	Nose-Fork Length	Sex	Egg Ret
16-Sep	47144	2	658	861	M	
16-Sep	47144	3	588	768	M	
16-Sep	47144	4	650	798	F	8
16-Sep	47144	5	540	665	F	213
16-Sep	47144	6	580	702	F	14
16-Sep	47144	7	557	682	F	0
16-Sep	47144	8	640	779	M	
16-Sep	47144	9	525	663	M	
16-Sep	47144	10	550	695	M	
16-Sep	47144	11	600	779	M	
16-Sep	47144	12	648	807	M	
16-Sep	47144	13	659	849	M	
16-Sep	47144	14	484	588	F	0
16-Sep	47144	15	597	740	F	0
16-Sep	47144	16	562	714	M	
16-Sep	47144	17	543	685	M	
16-Sep	47144	18	667	741	M	
16-Sep	47144	19	570	742	M	
16-Sep	47144	20	595	779	M	
16-Sep	47144	21	515	760	F	2
16-Sep	47144	22	648	830	M	
16-Sep	47144	23	523	548	F	0
16-Sep	47144	24	649	832	M	
16-Sep	47144	25	569	740	M	
18-Sep	47145	1	670	867	M	
18-Sep	47145	2	586	740	M	
18-Sep	47145	3	623	795	M	
18-Sep	47145	4	545	662	F	2
18-Sep	47145	5	668	700	F	1
18-Sep	47145	6	578	743	M	
18-Sep	47145	7	618	772	F	2
18-Sep	47145	8	476	580	F	3
18-Sep	47145	9	542	665	F	0
18-Sep	47145	10	549	688	F	0
18-Sep	47145	11	564	728	M	
18-Sep	47145	12	600	767	M	
18-Sep	47145	13	518	632	F	0
18-Sep	47145	14	525	628	F	26
18-Sep	47145	15	600	765	M	
18-Sep	47145	16	560	715	M	
18-Sep	47145	17	502	638	M	
18-Sep	47145	18	482	601	F	4
18-Sep	47145	19	522	634	F	9
18-Sep	47145	20	562	698	F	15
18-Sep	47145	21	560	742	M	
18-Sep	47145	22	530	632	F	0
18-Sep	47145	23	510	632	F	0
18-Sep	47145	24	619	739	F	0
18-Sep	47145	25	529	626	F	0
18-Sep	47146	1	528	637	F	135

Appendix 1 continued.

Date	Book #	Scale #	Hypural Length	Nose-Fork Length	Sex	Egg Ret
18-Sep	47146	2	572	728	M	
18-Sep	47146	3	559	708	M	
18-Sep	47146	4	608	759	M	
18-Sep	47146	5	551	718	M	
18-Sep	47146	6	568	735	M	
18-Sep	47146	7	562	717	M	
18-Sep	47146	8	565	727	M	
18-Sep	47146	9	598	764	M	
18-Sep	47146	10	565	727	M	
18-Sep	47146	11	576	741	M	
18-Sep	47146	12	547	698	M	
18-Sep	47146	13	566	704	F	0
18-Sep	47146	14	641	783	F	25
18-Sep	47146	15	595	749	M	
18-Sep	47146	16	539	686	M	
18-Sep	47146	17	611	785	M	
18-Sep	47146	18	591	719	F	0
18-Sep	47146	19	551	700	F	2
18-Sep	47146	20	575	721	F	1
18-Sep	47146	21	542	674	F	0
18-Sep	47146	22	510	622	F	167
18-Sep	47146	23	530	658	F	4
18-Sep	47146	24	687	760	F	0
18-Sep	47146	25	607	785	M	
18-Sep	47147	1	572	729	M	
18-Sep	47147	2	562	706	M	
18-Sep	47147	3	592	776	M	
18-Sep	47147	4	521	695	M	
18-Sep	47147	5	570	757	M	
18-Sep	47147	6	557	720	M	
18-Sep	47147	7	575	738	M	
18-Sep	47147	8	550	719	M	
18-Sep	47147	9	532	660	F	4
18-Sep	47147	10	590	733	F	3
18-Sep	47147	11	695	885	M	
18-Sep	47147	12	494	625	F	61
18-Sep	47147	13	538	659	F	0
18-Sep	47147	14	563	694	F	0
18-Sep	47147	15	662	772	M	
18-Sep	47147	16	570	745	M	
18-Sep	47147	17	509	630	F	53
18-Sep	47147	18	535	656	F	18
18-Sep	47147	19	549	670	F	107
18-Sep	47147	20	531	637	F	0
18-Sep	47147	21	590	755	M	
18-Sep	47147	22	540	688	F	3
18-Sep	47147	23	556	722	M	
18-Sep	47147	24	562	722	M	
18-Sep	47147	25	605	748	M	
18-Sep	47148	1	509	617	F	0

Appendix 1 continued.

Date	Book #	Scale #	Hypural Length	Nose-Fork Length	Sex	Egg Ret
18-Sep	47148	2	552	672	F	15
18-Sep	47148	3	502	675	M	
18-Sep	47148	4	590	799	M	
18-Sep	47148	5	578	741	M	
18-Sep	47148	6	568	742	M	
18-Sep	47148	7	567	730	M	
18-Sep	47148	8	567	680	F	14
18-Sep	47148	9	600	755	F	1
18-Sep	47148	10	595	781	M	
18-Sep	47148	11	586	769	M	
18-Sep	47148	12	620	813	M	
18-Sep	47148	13	623	790	M	
18-Sep	47148	14	569	734	M	
18-Sep	47148	15	566	703	F	0
18-Sep	47148	16	684	740	F	0
18-Sep	47148	17	554	703	M	
18-Sep	47148	18	564	717	M	
18-Sep	47148	19	614	802	M	
18-Sep	47148	20	600	757	M	
18-Sep	47148	21	580	732	M	
18-Sep	47148	22	584	726	M	
18-Sep	47148	23	599	683	F	8
18-Sep	47148	24	645	819	M	
18-Sep	47148	25	598	752	M	
23-Sep	47149	1	582	745	M	
23-Sep	47149	2	595	725	F	0
23-Sep	47149	3	496	600	F	1
23-Sep	47149	4	471	590	F	20
23-Sep	47149	5	495	621	F	14
23-Sep	47149	6	518	650	F	213
23-Sep	47149	7	555	672	F	1
23-Sep	47149	8	574	737	M	
23-Sep	47149	9	581	748	M	
23-Sep	47149	10	561	726	M	
23-Sep	47149	11	590	634	F	1
23-Sep	47149	12	490	626	F	35
23-Sep	47149	13	542	677	F	0
23-Sep	47149	14	583	759	M	
23-Sep	47149	15	574	725	F	7
23-Sep	47149	16	514	634	F	1
23-Sep	47149	17	510	624	F	0
23-Sep	47149	18	556	694	F	0
23-Sep	47149	19	663	878	M	
23-Sep	47149	20	539	643	M	
23-Sep	47149	21	567	746	M	
23-Sep	47149	22	592	720	F	2
23-Sep	47149	23	630	820	M	
23-Sep	47149	24	550	719	M	
23-Sep	47149	25	515	665	M	
23-Sep	47150	1	598	769	M	

Appendix 1 continued.

Date	Book #	Scale #	Hypural Length	Nose-Fork Length	Sex	Egg Ret
23-Sep	47150	2	460	561	F	0
23-Sep	47150	3	534	670	F	0
23-Sep	47150	4	683	760	M	
23-Sep	47150	5	582	758	M	
23-Sep	47150	6	624	816	M	
23-Sep	47150	7	550	712	M	
23-Sep	47150	8	543	709	M	
23-Sep	47150	9	568	725	M	
23-Sep	47150	10	537	642	F	47
23-Sep	47150	11	518	636	F	3
23-Sep	47150	12	532	658	F	565
23-Sep	47150	13	514	650	F	0
23-Sep	47150	14	561	700	F	37
23-Sep	47150	15	499	611	F	317
23-Sep	47150	16	506	614	F	362
23-Sep	47150	17	534	645	F	0
23-Sep	47150	18	538	660	F	627
23-Sep	47150	19	549	678	F	211
23-Sep	47150	20	472	578	F	103
23-Sep	47150	21	534	654	F	15
23-Sep	47150	22	609	772	M	
23-Sep	47150	23	555	712	M	
23-Sep	47150	24	600	770	M	
23-Sep	47150	25	541	705	M	
23-Sep	47151	1	571	721	M	
23-Sep	47151	2	502	626	F	0
23-Sep	47151	3	558	687	F	1
23-Sep	47151	4	527	640	F	0
23-Sep	47151	5	539	643	F	172
23-Sep	47151	6	489	587	F	151
23-Sep	47151	7	513	620	F	1
23-Sep	47151	8	542	695	F	0
23-Sep	47151	9	519	668	M	
23-Sep	47151	10	597	760	M	
23-Sep	47151	11	519	660	M	
23-Sep	47151	12	547	678	F	0
23-Sep	47151	13	533	648	F	0
23-Sep	47151	14	500	609	F	0
23-Sep	47151	15	500	609	F	3
23-Sep	47151	16	508	630	F	5
23-Sep	47151	17	489	603	F	0
23-Sep	47151	18	507	627	F	0
23-Sep	47151	19	511	652	M	
23-Sep	47151	20	563	693	F	207
23-Sep	47151	21	563	714	M	
23-Sep	47151	22	512	636	F	0
23-Sep	47151	23	465	578	F	0
23-Sep	47151	24	551	663	F	0
23-Sep	47151	25	560	717	M	
23-Sep	47152	1	572	747	M	

Appendix 1 continued.

Date	Book #	Scale #	Hypural Length	Nose-Fork Length	Sex	Egg Ret
23-Sep	47152	2	557	734	M	
23-Sep	47152	3	530	671	M	
23-Sep	47152	4	589	748	M	
23-Sep	47152	5	621	790	M	
23-Sep	47152	6	558	716	M	
23-Sep	47152	7	558	732	M	
23-Sep	47152	8	525	657	M	
23-Sep	47152	9	507	658	M	
23-Sep	47152	10	562	697	M	
23-Sep	47152	11	502	647	M	
23-Sep	47152	12	535	691	M	
23-Sep	47152	13	565	728	M	
23-Sep	47152	14	526	645	F	0
23-Sep	47152	15	567	713	M	
23-Sep	47152	16	565	694	F	10
23-Sep	47152	17	624	747	F	3
23-Sep	47152	18	509	628	F	0
23-Sep	47152	19	569	693	F	1
23-Sep	47152	20	530	638	F	1
23-Sep	47152	21	585	744	M	
23-Sep	47152	22	574	620	M	
23-Sep	47152	23	508	628	F	25
23-Sep	47152	24	456	578	F	0
23-Sep	47152	25	509	629	F	1
25-Sep	47153	1	564	788	F	15
25-Sep	47153	2	588	739	M	
25-Sep	47153	3	595	762	M	
25-Sep	47153	4	573	714	M	
25-Sep	47153	5	606	790	M	
25-Sep	47153	6	407	624	F	16
25-Sep	47153	7	457	676	F	4
25-Sep	47153	8	497	607	F	0
25-Sep	47153	9	513	648	F	0
25-Sep	47153	10	519	658	F	233
25-Sep	47153	11	532	588	F	4
25-Sep	47153	12	534	716	M	
25-Sep	47153	13	554	706	M	
25-Sep	47153	14	537	651	F	0
25-Sep	47153	15	548	681	F	0
25-Sep	47153	16	522	646	F	1
25-Sep	47153	17	534	660	F	0
25-Sep	47153	18	530	692	M	
25-Sep	47153	19	523	682	M	
25-Sep	47153	20	576	731	M	
25-Sep	47153	21	533	704	M	
25-Sep	47153	22	621	791	M	
25-Sep	47153	23	500	612	F	0
25-Sep	47153	24	530	639	F	0
25-Sep	47153	25	515	625	F	13
25-Sep	47154	1	550	683	F	1

Appendix 1 continued.

Date	Book #	Scale #	Hypural Length	Nose-Fork Length	Sex	Egg Ret
25-Sep	47154	2	404	625	F	93
25-Sep	47154	3	548	786	M	
25-Sep	47154	4	574	738	M	
25-Sep	47154	5	609	780	M	
25-Sep	47154	6	548	704	M	
25-Sep	47154	7	523	669	M	
25-Sep	47154	8	603	766	M	
25-Sep	47154	9	572	731	M	
25-Sep	47154	10	598	761	M	
25-Sep	47154	11	521	628	F	0
25-Sep	47154	12	558	688	F	2
25-Sep	47154	13	528	652	F	1
25-Sep	47154	14	497	613	F	3
25-Sep	47154	15	511	632	F	0
25-Sep	47154	16	550	680	F	0
25-Sep	47154	17	571	741	M	
25-Sep	47154	18	521	632	F	1
25-Sep	47154	19	539	669	F	6
25-Sep	47154	20	569	681	F	10
25-Sep	47154	21	582	789	F	37
25-Sep	47154	22	532	658	F	0
25-Sep	47154	23	545	692	F	0
25-Sep	47154	24	537	680	M	
25-Sep	47154	25	557	708	M	
25-Sep	47155	1	617	787	M	
25-Sep	47155	2	528	650	F	0
25-Sep	47155	3	546	698	F	0
25-Sep	47155	4	507	629	F	2
25-Sep	47155	5	496	597	F	11
25-Sep	47155	6	552	676	F	0
25-Sep	47155	7	573	707	F	0
25-Sep	47155	8	512	623	F	63
25-Sep	47155	9	550	697	M	
25-Sep	47155	10	568	738	M	
25-Sep	47155	11	563	720	M	
25-Sep	47155	12	552	713	M	
25-Sep	47155	13	610	769	M	
25-Sep	47155	14	503	625	F	22
25-Sep	47155	15	554	664	F	0
25-Sep	47155	16	545	670	F	0
25-Sep	47155	17	562	692	F	151
25-Sep	47155	18	514	638	F	203
25-Sep	47155	19	544	665	M	
25-Sep	47155	20	578	739	M	
25-Sep	47155	21	604	765	M	
25-Sep	47155	22	525	628	F	0
25-Sep	47155	23	533	645	F	0
25-Sep	47155	24	524	619	F	10
25-Sep	47155	25	635	812	M	
25-Sep	47156	1	556	693	F	11

Appendix 1 continued.

Date	Book #	Scale #	Hypural Length	Nose-Fork Length	Sex	Egg Ret
25-Sep	47156	2	512	650	F	5000
25-Sep	47156	3	544	714	M	
25-Sep	47156	4	525	672	M	
25-Sep	47156	5	558	700	M	
25-Sep	47156	6	592	756	M	
25-Sep	47156	7	535	645	F	2
25-Sep	47156	8	578	738	M	
25-Sep	47156	9	542	725	M	
25-Sep	47156	10	558	712	M	
25-Sep	47156	11	576	731	M	
25-Sep	47156	12	514	630	F	0
25-Sep	47156	13	534	664	F	17
25-Sep	47156	14	513	618	F	83
25-Sep	47156	15	464	575	F	1
25-Sep	47156	16	499	608	F	96
25-Sep	47156	17	527	658	M	
25-Sep	47156	18	556	724	M	
25-Sep	47156	19	580	721	M	
25-Sep	47156	20	579	734	M	
25-Sep	47156	21	561	706	M	
25-Sep	47156	22	589	648	F	43
25-Sep	47156	23	406	609	F	0
25-Sep	47156	24	528	654	F	123
25-Sep	47156	25	499	605	F	241
25-Sep	47157	1	527	548	F	0
25-Sep	47157	2	593	727	F	0
25-Sep	47157	3	592	750	M	
25-Sep	47157	4	518	670	M	
25-Sep	47157	5	546	669	M	
25-Sep	47157	6	593	749	M	
25-Sep	47157	7	618	792	M	
25-Sep	47157	8	529	665	F	4
25-Sep	47157	9	569	698	M	
25-Sep	47157	10	500	628	F	23
25-Sep	47157	11	555	682	F	0
25-Sep	47157	12	572	728	M	
25-Sep	47157	13	564	727	M	
25-Sep	47157	14	588	728	M	
25-Sep	47157	15	542	702	M	
25-Sep	47157	16	514	622	F	0
25-Sep	47157	17	552	673	F	8
25-Sep	47157	18	583	695	F	0
25-Sep	47157	19	539	658	F	10
25-Sep	47157	20	496	611	F	1
25-Sep	47157	21	488	686	F	50
25-Sep	47157	22	518	645	F	0
25-Sep	47157	23	570	728	M	
25-Sep	47157	24	555	717	M	
25-Sep	47157	25	554	717	M	

Appendix 2: Chum salmon data from Nekite River GSI samples.

Date	Box #	Oto. #	Hypural Length	Nose-Fork Length	Sex
27-Sep	80055	1	499	623	F
27-Sep	80055	2	497	652	M
27-Sep	80055	3	580	702	F
27-Sep	80055	4	592	774	M
27-Sep	80055	5	565	728	M
27-Sep	80055	6	541	662	F
27-Sep	80055	7	552	682	F
27-Sep	80055	8	521	639	F
27-Sep	80055	9	534	668	F
27-Sep	80055	10	532	678	F
27-Sep	80055	11	493	618	F
27-Sep	80055	12	538	668	F
27-Sep	80055	13	545	670	F
27-Sep	80055	14	512	634	M
27-Sep	80055	15	570	738	M
27-Sep	80055	16	530	703	M
27-Sep	80055	17	534	671	F
27-Sep	80055	18	518	648	F
27-Sep	80055	19	566	724	M
27-Sep	80055	20	502	757	M
27-Sep	80055	21	569	733	M
27-Sep	80055	22	555	717	M
27-Sep	80055	23	530	675	M
27-Sep	80055	24	523	700	M
27-Sep	80055	25	589	750	M
27-Sep	80055	26	575	725	M
27-Sep	80055	27	535	695	M
27-Sep	80055	28	525	625	M
27-Sep	80055	29	565	715	M
27-Sep	80055	30	530	660	M
27-Sep	80055	31	555	655	F
27-Sep	80055	32	530	630	F
27-Sep	80055	33	500	600	F
27-Sep	80055	34	530	710	M
27-Sep	80055	35	530	640	F
27-Sep	80055	36	510	640	M
27-Sep	80055	37	550	670	F
27-Sep	80055	38	565	720	F
27-Sep	80055	39	550	690	M
27-Sep	80055	40	560	715	M
27-Sep	80055	41	555	710	M
27-Sep	80055	42	480	610	M
27-Sep	80055	43	540	695	M
27-Sep	80055	44	500	610	F
27-Sep	80055	45	500	615	F
27-Sep	80055	46	520	665	F
27-Sep	80055	47	530	690	M
27-Sep	80055	48	500	625	F

Appendix 2 continued.

Date	Box #	Oto. #	Hypural Length	Nose-Fork Length	Sex
27-Sep	80055	49	530	660	F
27-Sep	80055	50	585	715	F
27-Sep	80060	1	552	652	F
27-Sep	80060	2	554	759	M
27-Sep	80060	3	498	618	F
27-Sep	80060	4	548	682	F
27-Sep	80060	5	519	648	F
27-Sep	80060	6	562	723	M
27-Sep	80060	7	569	743	M
27-Sep	80060	8	559	679	F
27-Sep	80060	9	523	658	F
27-Sep	80060	10	572	740	M
27-Sep	80060	11	540	675	F
27-Sep	80060	12	519	646	F
27-Sep	80060	13	530	659	F
27-Sep	80060	14	545	725	M
27-Sep	80060	15	533	668	F
27-Sep	80060	16	550	713	M
27-Sep	80060	17	500	647	M
27-Sep	80060	18	482	619	M
27-Sep	80060	19	464	623	M
27-Sep	80060	20	485	608	F
27-Sep	80060	21	537	679	F
27-Sep	80060	22	475	618	F
27-Sep	80060	23	508	625	F
27-Sep	80060	24	484	595	F
27-Sep	80060	25	535	687	M
27-Sep	80060	26	585	628	F
27-Sep	80060	27	555	769	M
27-Sep	80060	28	567	738	M
27-Sep	80060	29	457	581	F
27-Sep	80060	30	580	782	M
27-Sep	80060	31	580	733	F
27-Sep	80060	32	548	690	F
27-Sep	80060	33	581	740	F
27-Sep	80060	34	492	653	M
27-Sep	80060	35	531	659	F
27-Sep	80060	36	531	675	F
27-Sep	80060	37	498	624	F
27-Sep	80060	38	521	665	F
27-Sep	80060	39	502	623	F
27-Sep	80060	40	522	682	M
27-Sep	80060	41	528	648	F
27-Sep	80060	42	544	715	M
27-Sep	80060	43	503	625	F
27-Sep	80060	44	507	634	F
27-Sep	80060	45	529	654	F
27-Sep	80060	46	523	698	M
27-Sep	80060	47	518	635	F
27-Sep	80060	48	555	706	M

Appendix 2 continued.

Date	Box #	Oto. #	Hypural Length	Nose-Fork Length	Sex
27-Sep	80060	49	579	718	F
27-Sep	80060	50	512	668	M